

# RAJASTHAN ELECTRICITY REGULATORY COMMISSION

In the matter of determination of tariff for sale of electricity from wind and biomass based generating stations to Distribution Licensee.

## Quorum

Mr. K. L. Vyas, Member (in chair)

### Commenters/ Suggesters:

1. Government of Rajasthan. ('GoR')
2. Rajasthan Renewable Energy Corporation Ltd.,Jaipur. ('RREC')
3. Indian Wind Power Association. ('IWPA')
4. Indian Wind Energy Association. ('InWEA')
5. Riti Contruction ('RITI')
6. Suzlon Windfarm Services. ('Suzlon')
7. Sh.D.S.Agarwal,Rudraksh Energy.
8. Rajasthan Biomass Power Developers Association ('RBPDA')

### Present:

1. Shri Rajeeva Swarup,Chairman & M.D.,RREC,Jaipur
2. Sh.D.S.Agarwal,Rudraksh Energy,Jaipur.
3. Ssh.N.M.Sareen,CE(Comml.),JVVNL,Jaipur.
4. Sh.B.K.Mkhija,SE(NPP),RVPN,Jaipur.
5. Sh.S.R.G. Sabal,Dy. Chief Engineer(RPPC)
6. Sh.Anil Patni,Project Manager,RREC.
7. Sh.A.V.Raghavan,Indian Wind Power Association (IWPA).
8. Sh.Vinod Bishnoi,M/S Suzlon Wind Farm Secrvices.
9. Sh.R.Vyas,M/S Enercon & Riti Construction.
10. Sh.V.N.Bohra,Counseller,Riti Contruction.
11. Sh.Ajit Pandit,Indian Wind Energy Association (InWEA)
12. Sh.Pradeep Kumar,Indian Wind Energy Association.(InWEA)
13. Sh.Sanjay Kumar,Rajasthan Biomass Power Developers Association(RBPDA).
14. Sh.Mahesh Mansukhani,(RBPDA)
15. Sh.Paramdeep Singh,(RBPDA)
16. Sh.Vivek Sharma,CRISIL.
17. Sh.Himanshu Srivastava,CRISIL.

Date of hearing: 24.02.2007

Date of Order: 09.03.2007

## ORDER

Section 61(h) of the Electricity Act, 2003 provides that while specifying the terms and conditions of determination of tariff, Regulatory Commission shall be guided, inter alia, by the promotion of cogeneration and generation of electricity from renewable sources of energy and National Electricity Policy (NEP) & Tariff Policy notified by the Central Government under the provisions of section 3(1) of the Act. Section 86(1)(e) of the Act specifies that one of the functions of the Regulatory Commission is to promote cogeneration and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with grid and to promote sale of such power to any person. The regulatory commission is also required to specify for the purchase of electricity from such sources, a percentage of total consumption of electricity in the area of a distribution franchisee.

At para 6.4 of tariff policy, it has been recognized that it will take some time for non-conventional technologies to compete conventional sources of energy, hence this procurement shall be done at preferential tariffs to be determined by the Commission and states as under :

- (2) Such procurement by Distribution Licensees for future requirements shall be done, as far as possible, through competitive bidding process under Section 63 of the Act within suppliers offering energy from same type of non-conventional sources. In the long-term, these technologies would need to compete with other sources in terms of full costs.*
- (3) The Central Commission should lay down guidelines within three months for pricing non-firm power, especially from non-conventional sources, to be followed in cases where such procurement is not through competitive bidding.*

The Commission vide order dt. 29<sup>th</sup> September 2006 have already directed distribution companies/RREC to initiate action for

procurement of RE through competitive bidding and the Central Commission have not yet come out with any guidelines for pricing of non-firm power where competitive bidding is not resorted to.

2. The Commission came up with a Consultation Paper on "Power Purchase from Non-Conventional Energy Sources in Rajasthan" during November 2005 on which comments/suggestions were invited by 9<sup>th</sup> January 2006. The Commission has considered the comments/suggestions and provisions of tariff policy notified by the Government of India and came up with an Order on "Power Purchase from Non-Conventional Energy Sources in Rajasthan" on 31.03.2006.
3. Based on the said order, the Commission has considered amendments to RERC (Power Purchase & Procurement Process of Distribution licensees) Regulations 2004 for specifying percentage of power purchase from RE Power.
4. The said order was opened for general review for 3 months. The Commission received seven petitions for reviewing the order. The Commission also issued a public notice inviting comments/suggestions on the above review petitions and draft Regulations "RERC (Terms & Conditions for Determination of Tariff) (Third Amendment) Regulations, 2006" Part VIII in the matter related to the power purchase from Non-Conventional Energy Sources in Rajasthan. The stake holders commented upon the norms specified in the draft regulations as well as on the order dated 31.03.2006 issued by the Commission. The Commission after considering due comments/suggestions in the hearing held on 31.08.2006 from

various stakeholders issued Order on 29.09.2006 on "Power Purchase from Non-Conventional Energy Sources in Rajasthan", RERC (Terms and Conditions for Determination of Tariff) (Third Amendment) Regulations, 2006 which was published in Gazette on dated 2.01.2007 and another regulations specifying the percentage of power of the total consumption to be procured by distribution licensee called as Rajasthan Electricity Regulatory Commission(Power Purchase & Procurement Process of Distribution Licensee)Regulations,2004.

4. Based on the above regulations, the Commission has worked out the proposed tariffs for sale of electricity by Wind and Biomass (Mustard Residue) Energy Generating Stations to distribution licensees of the State based on the normative parameters along with an explanatory note & worksheets of tariff determination through prior publication in the newspapers inviting comments from the public and other stakeholders. Public notice was placed on the website of RERC and was also published in the news papers as under:-

- |      |                   |            |
|------|-------------------|------------|
| (i)  | Rajasthan Patrika | 30.11.2006 |
| (ii) | Rashtrdoot        | 30.11.2006 |

6. The last date of the invitation of comments/suggestions by the stakeholders was 15th December 2006, which was later extended to 26th December 2006. The Commission conducted public hearing on 24th February 2007 wherein all the objectors/ stakeholders present in the earlier hearing were present and raised similar issues

with new facts requesting for consideration in determination of the tariff.

7. The Commission has analyzed the objections raised by different stake holders on the tariff proposal, the various facts that were placed in the record including data from C-WET and RREC, earlier Regulations/orders issued by the Commission. The Commission has categorized objections into specific issues and discussed in this Order firstly with the norms relating to Wind and then Biomass based power plants.

**A. WIND POWER PLANT**

CAPACITY UTILIZATION FACTOR (CUF)

8. Sh.A.V.Raghavan of Indian Wind Power Association (IWPA) has submitted wind data of 2.1 MW demonstration wind farm of Phalodi for the last three years. The objector has also submitted a list of various wind farm projects and their respective Capacity Utilization Factor (CUF) during FY 2004-05. He submitted that as per data, CUF for Barmer & Jodhpur districts is less than that for Jaisalmer and requested the Commission to exclude Jodhpur district from 22% band and include the same with other areas with 20% CUF.
9. Sh.V.N.Bohra of M/s Riti Construction stated that demonstration plant installed at Phalodi gives CUF of 18%. The role of the Commission is to promote RE Power in the State. Enough wind plants have come up in Jaisalmer region. Jodhpur & Barmer districts are economically poor. Therefore, liberal norms should be adopted for Jodhpur and requested to exclude the district of Jodhpur from the

combination of Jaisalmer/Barmer/Jodhpur and to approve the CUF around 20% for Jodhpur district.

10. RREC has submitted the average CUF of 2.1 MW demonstration wind farm of Phalodi in Jodhpur district since commissioning and is as follows:

Sr. No.	Year	Generation (kwh)	%CUF
1	2001-2002	2986530	16.23%
2	2002-2003	3854160	20.95%
3	2003-2004	2872050	15.61%
4	2004-2005	3413310	18.55%
5	2005-2006	2879760	15.65%
		Average % CUF	17.40%

11. Sh.Rajeeva Swarup, CMD, RREC stated that the average CUF in Jodhpur is 17.40% and it has never reached to 22%. RREC requested the Commission to extend the applicability of 20% CUF for Jodhpur and Barmer districts also at par with other districts of Rajasthan.
12. RREC in its written representation has requested the Commission to make provision for adjustment of CUF of 22% subject to a minimum of 20% during a financial year in Barmer & Jodhpur Districts while determining the tariff for projects set up in these districts. In case the CUF works out below 22% in a financial year, then tariff will be calculated on the basis of actual CUF subject to minimum of 20% and arrears in this regard payable by Discoms. In case CUF in these districts exceeds 22% in a financial year, the tariff will be redetermined based on actual CUF achieved and extra amount disbursed shall be adjusted against the bill raised for the subsequent year (i.e. the year in which the actual analysis of data is done).

13. Government of Rajasthan has requested the Commission to review its order dated 29.09.2006 stating that the State Government has received proposals from developers for setting up wind energy farms to the extent of 400 MW, with more in the pipeline, in Phalodi region of Jodhpur district. The Commission may keep the 22% CUF for Jaisalmer district on the ground that it has greater potential and whereas, Jodhpur and Barmer districts have to be brought at par with the other districts at 20% CUF both on the ground of actual data as well as the fact that as on date no private investment has taken place in these districts.
14. Sh. Ajit Pandit representing for InWEA complemented the Commission for considering the differential CUF for different sites in the state of Rajasthan as this approach would rather bring in much needed regulatory certainty and will boost the investor confidence.
15. Sh.D.S.Agarwal of Rudraksh Energy expressed that CUF for Jodhpur & Barmer area are different from Jaisalmer. Accordingly, their CUF should be different. The area should be clubbed with other districts of Rajasthan.
16. Sh.N.M.Sareen appearing for JVVNL submitted during the hearing that RREC is the nodal agency for the development of RE in the State who gave his submission on behalf of the State Government and stated that the submissions made by RREC are reasonable and fair in the context of RE promotion and are thus endorsed by JVVNL also.

### **Commission Ruling**

17. The Commission notes that, with the new and improved data/information now made available to the Commission for wind speeds and CUFs, the CUF of 22% needs to be reviewed for the purpose of tariff determination.
18. The tariff setting mechanism must promote efficiency in identification of good and potential sites, and in operational ease. Determination of Project Specific Tariff would lead to administrative difficulty in verifying the CUF structure of various projects as well as it would lead to promotion in the inefficient sites with lower wind speeds and low CUF, which are economically unviable.
19. Ministry of Non-conventional Energy sources in its annual report has suggested that the sites with less than 200 Watt per square meter wind potential should be discouraged. As per the C-WET norms any site with more than 200 Watt per square meter under modified technology would generate 20% CUF.
20. The Commission also notes that other Commissions have determined tariffs with minimum CUF of the range of 20-25%, therefore, the Commission rules that CUF of 20% must be set as minimum benchmark that the investors should target to achieve. Anything lower than this would encourage inefficient site selection and discourages technology advancement and R&D.
21. Based on past data, the Commission's order dtd.29.9.2006 para 67 the Regulation has classified districts in two categories with 20% and



22% potential CUF. The issue is thus for review of the CUF specified by the Commission so that the apparent error if any is corrected. The Commission notes that the earlier data which formed the basis for specifying 22% CUF for Jaisalmer, Barmer and Jodhpur district which was the actual CUF achieved for Jaisalmer sites already developed. The Jaisalmer district has the largest geographical area in the country and the good potential sites for wind development has already been identified exploited (are within 30-40 km radius of the Jaisalmer town) and no wind data for area other than this could be produced before the Commission hence the Commission relied upon the value of CUF adopted by the RREC in determining the tariff for wind power plant to be considered by State Govt. in the policy. However the Govt. in their letter dt. 8<sup>th</sup> January 2007 had given the indication that the tariff considered by the Govt. in the policy is not favourable for the investor to set up power plant. The Commission had also relied upon the facts that the availability of wind pattern in the part of Jaisalmer district where such wind farm had not yet been developed is similar to remaining part of Jaisalmer district as well as for Barmer and Jodhpur districts due to its contiguity and similar nature of the terrain and as also shown in the wind tunnel diagram of State [source SPRI Vision, JUNE 2006]. The RREC has now furnished the wind data for last 5 years for Phalodi site [Jodhpur district], duly authenticated by C-WET Chennai. A request was thus made to C-WET to assess the CUF for different manufacturers' Wind Electric Generators [WEG] for this period. As the wind data for two years were missing the CUF assessment for 2001-02, 2004-05, 2005-06 in respect of the following make and models have been done by C-WET :

S.No.	Manufacturer	CUF in percentage		
		2001-02	2004-05	2005-06
1	M/s.Suzlon	18.45	20.93	16.43
2	M/s.Enercon	21.88	24.42	19.81
3	M/s.NEG MICON	19.76	22.24	17.88

Overall average = 20.20%

The Commission has also got the assessment done for CUF for 2002-03 and 2003-04 by assuming the wind data for Feb'03 to April'03 as to be the average of the data in corresponding months of the years 2002, 2004. The results of the analysis shows similar pattern.

The Commission also notes that with better technology and micrositing, it is possible to achieve CUF even higher. Various technologies as considered by C-WET are orthodox, modified and improved. Each has its own financial implication in the form of capital cost. WEG of orthodox technology are the cheapest while that of improved technology are the costliest whereas the modified technology WEG cost in between (on per MW basis). The improvement in CUF is not in the same proportion as increase in the cost for improved technology, a balance is, thus, generally struck by using modified technology to derive optimum output with overall economy.

The consultant has calculated the Mode of wind power density for Phalodi site considering the pattern of wind speed monthwise for the year, which works out to be about 262 Watt/m<sup>2</sup>. The Commission also notes that C-WET norms for estimating CUF based on wind power density relating the various technology applied are as under:

% CUF for different power densities			
Technology	200-300 [Watt/m <sup>2</sup> ] Low	300-400 [Watt/m <sup>2</sup> ] Medium	Above 400 [Watt/m <sup>2</sup> ] High
Orthodox	18	20	22
Modified	20	22	24
Improved	22	24	26

Keeping in view the above new facts now came to the notice of the Commission and the submissions made by all the stakeholders including the distribution licensee and also considering that the sites of Jaisalmer district having better potential of wind power development had already been largely exploited and there is need to develop activities in the rest of Jaisalmer district. Jaisalmer district has the largest geographical area not only in the State but also in country as such the different sites may have different wind potential within the district. It is also observed that the remaining unexploited area is similar to that of Jodhpur and Barmer district where the prospects of such development exist. It is, thus, considered to adopt the CUF for new plants in Jaisalmer, Jodhpur and Barmer district to be at 21% for tariff calculation.

22. The Commission acknowledges that going forward with the improvement of datasets based on the actual wind availability and performance level of WEG in the area, the Commission would again re-look at potential CUF levels. However, the Commission believes that less completeness of data should not delay the required promotional activity in the State. Therefore for the time being, the Commission considers CUF norms for Jaisalmer, Jodhpur and Barmer areas are kept at 21% for tariff determination. The

review of the regulations would be separately carried out in this regard.

### **Metering and Line losses**

23. RREC has stated that the CUF for wind power plant as approved by the Commission are measured at the individual WEG, whereas the power generated by wind power projects is actually being measured and paid at the metering to be provided by the transmission company at their receiving station. RREC has estimated the line losses for Wind Power Project at Mada Pooling station of one developer for the year 2006
24. RREC has submitted that the line losses are varying in the range of 4% to 10% as per the actual data for the plants already in operation for the period January, 06 to Dec, 06 and the Commission should either give directives to the Discoms to immediately change the metering point in accordance with the manner that the Commission has determined the output, else the Commission should take into consideration of the line losses between the WEG and the metering point.
25. Sh.Ajit Pandit submitted that energy generated need to be monitored and metered at ex-generator bus at generating station where the CUF is calculated. The compensation to WEG developer should be for the energy units metered at ex-generator bus but as per the regulation, the energy metering and billing point has been specified to be interconnection point. The interconnection point as defined in the regulation is "Interconnection Point" means a point

at EHV substation of transmission licensee, where the electricity produced from RE power plant is injected into the Rajasthan Grid.”, Hence, he requested to clarify that transmission loss and transformation loss to EHV grid, should be to the account of licensee or the tariff should be so designed which takes such losses into account.

26. Sh.Raghavan stated that line losses are of the order of 5-6% which should be considered as auxiliary consumption and accordingly losses be accounted for in tariff finalization.
27. Sh.Vinod Bishnoi submitted that line losses are in the range of 6% and should be considered in determining Tariff.

### **Commission Ruling**

28. Although none of the objectors could produce any calculation in support of their demand for any specific level of losses to be considered by the Commission. The Commission got worked out the different losses in the system, from WEG upto the interconnection point where the metering/billing is done for supply to distribution licensee. The Commission is of the view that the following level of losses so worked out can be safely adopted:

1. For injection of power through 11kV or 33kV system – 1.0%
2. For injection of power through 132kV or 220 kV system –4.0%

The Commission would thus like to clarify that the CUF proposed in the Regulations are at the WEG level only and not at the Interconnection Point, where electricity produced from RE power plant is injected into Rajasthan grid. For the purpose of tariff determination the Commission has now considered average losses

(including line losses, transformation losses, auxiliary consumption) 1% between the WEG for metering point at the 33 kV system and 4% if the metering point on EHV system for EHV line length upto 50 kms. For EHV line length beyond 50 km, the total losses of the energy delivered should be below 4.0%. If it increases then the system may be strengthened by adding extra circuit or to adopt next higher voltage to contain the losses in delivery of energy within limit. The impact of these additional losses on the tariff for EHV (beyond 50 km) works out to nearly 2 P/ kwh to be allowed uniformly for any length for the sake of simple application.

### **Capital Cost of Wind Power Plant**

29. The Indian Wind energy association (InWEA), in its submission has sought review on capital cost for wind power projects stating that it is low and submits to consider capital cost of project till pooling station (i.e. without transmission and evacuation cost) to be in the range of Rs. 4.25 to Rs.4.75 Cr/MW.
  
30. Sh.Ajit Pandit submitted that the inflation rate in the Indian economy is higher than normal long run average inflation rate in the recent past. Especially in the past two years there has been substantial increase in prices of steel and cement, which contribute significantly to wind turbine structure. In addition, the capex is bound to increase on a year-on-year basis, on the basis of inflationary trend too. He requested the Commission that the capital cost of wind projects in Rajasthan needs to be viewed in light of these factors.

31. Sh. Rajeev Swarup, CMD, RREC stated that even for public sector companies setting up wind farms in the recent past through open competitive bidding, the rates received are substantially higher. The State Government had considered such rates while revising tariff in February 2006. The parameters finally arrived at by the Commission is static without the consideration of any inflation in cost of basic inputs like cost of steel & cement etc. which is increasing sharply. If the premise of the Commission is to provide tariff to renewable energy sources on cost plus return on investment basis, it would be appropriate that Commission should provide scope for cost increase on account of inflationary pressures. He further elaborated that the commissioning period of wind power projects ranges from 6 months to 12 months and that for biomass based power project from 18 months to 24 months and therefore, provision for inflation in the capital cost should be made while calculating the tariff. RREC stated that price of wind generators are based on September'06 level whereas the plants will be commissioned after 31.3.2007. Therefore for this suitable escalation be provided and capital cost be revised accordingly.
32. M/s Suzlon Energy Limited has proposed the capital cost of Rs 4.47 Cr/MW for wind power plants for FY 2007-08 after including inflationary increase. Suzlon Energy Limited has also provided the Annual report of FY05-06 of M/s Suzlon Energy Limited highlighting that the average cost of wind power generators of size 0.35 MW to 2.1 MW, varies from Rs. 3.78 Cr/MW (FY 2004-05) to Rs. 3.86 Cr/MW (FY 2005-06) exclusive of foundation and installation cost.

33. IWPA has submitted the capital cost of Rs. 4.53 Cr/MW for wind power project exclusive of transmission system and connectivity charges.
34. Government of Rajasthan has also requested to revise the capital cost of Rs.422 Lakhs per MW as considered by the Commission for plant, machinery & civil works. While drawing reference of the Gujarat Electricity Regulatory Commission tariff order dated 11.08.2006 wherein the capital cost has been considered as Rs.435 Lakhs per MW and stating that the magnitude of machinery and transportation costs are considerable. The machinery for the wind farms is normally manufactured in Daman, neighbouring Gujarat (Suzlon & Enercon) and South India (Vestas RRB). The cost of transportation to Rajasthan is significantly higher as compared to Gujarat. The capital cost of plant would be higher than that of Gujarat.

On the same lines, GoR has also requested the Commission to review the transmission/evacuation cost from the Pooling Station to Receiving Station on the ground that in the aforesaid GERC tariff order, transmission/evacuation cost from Pooling Station to Receiving Station has been considered as Rs. 30 Lakhs per MW and consideration of Rs.20 Lakhs per MW (about two thirds than that of Gujarat) for similar work is not justified.

Shri Bishnoi & InWEA expressed that based on project estimates; available to them, it is not possible to implement the transmission system of the scope (inclusive of 30 km EHV lines) in the stipulated cost of Rs.20 lakhs per MW. InWEA requested the Commission to



treat the charges at actual or ask the STU to build the entire EHV system. However, for the current tariff computation, InWEA has pegged the evacuation cost at Rs.25 Lakhs per MW till pooling station, and beyond this point it is assumed that the evacuation cost is incurred by the utility. Shri Bishnoi requested the Commission to accept the transmission tariff if it is through competitive bidding route as provided in the Act.

### **Commission Ruling**

35. The Commission has dealt with this issue in detail during the proceeding of Order dt.29.09.2006. The Commission notes that neither any new material evidence was provided nor the arguments provided are extraordinarily deviating from the material facts placed in record during the earlier proceedings.

The Commission reiterates that world over the capital cost of wind projects are declining with the improvement in technology as well as maturity in the market. The Commission has also observed that the higher capital cost per MW of WEG is attributed to the improved technology used which gets compensated for higher CUF automatically. This part has already been discussed in the para relating to CUF in the context of most economic selection of WEG technology. The Commission expects similar trend emerging in India. Moreover, the present tariff structure arising out of the regulations is valid upto 31.3.2009 and after that tariff could be adopted based on competitive bidding. Hence after the control period with more certainty, maturity and improvement in data sets,

the future regulation or competitive bidding will take care of this issue.

As such no change is required in the capital cost mentioned in the Regulations. The developers are free to follow competitive bidding route as for transmission system also as per Govt. of India guidelines and that tariff will be adopted by the Commission.

### **O & M Expenses**

36. In WEA and IWPA have stated that wind power plants are usually installed over a wide area, which is difficult to access and wind in the state of Rajasthan have sand content causing abrasion in the blades, leading to regular maintenance of the blades and other equipments. On account of the above submission, In WEA urges the Commission to consider an O&M Expenses of 1.5% of project cost and an escalation factor of 5% per annum for the purpose of tariff determination.

### **Commission Ruling**

37. The Commission in its order dated 29.09.2006 at para 74 has already considered all these aspects and no new fact has been brought about which warrants for any review therein. The Commission, therefore, deems it fit to retain O&M expenses of 1.25% of the project cost with an escalation of 5% per annum for the purpose of tariff determination as per the regulation.

### **Interest on Debt and Term of Loan**

38. Sh.Rajeeva Swarup, CMD, RREC sought review on the interest rate fixed by the Commission for the purpose of tariff determination stating that it is low. He further stated that recently interest rates

have been hiked and the Reserve Bank of India is in the process of further increasing the interest rates on account of inflationary pressures and suggested that the Commission should incorporate a provision for increase in interest rate for the purpose of tariff determination.

Sh. Raghavan also submitted that current interest rates are around 12.5% to 13.0% whereas the Commission has considered 10% interest rate in its working sheets. The rate on debt should be taken as per present market rate by the Commission.

### **Commission Ruling**

39. The Commission acknowledges that the interest rate varies from time to time and may both 'increase' or 'decrease' in future. The Commission is of the opinion that 10% interest represents the potential average interest rate for the first control period and therefore, the interest rate at 10% as specified in the order dated 29.09.2006 on long term debt is reasonable for tariff determination process.
  
40. Repayment of loan after due consideration is considered as 10 years with one year's moratorium with effect from first disbursement. The same is considered with first disbursement as 6 months before COD.

### **Income Tax Liability (Minimum Alternate Tax-MAT)**

41. Sh.A.V.Raghavan of Minimum Alternate Tax – MAT submitted that the credit in respect of MAT shall not be available for set-off beyond the 7<sup>th</sup> year of operation and the credit taken in the 16<sup>th</sup> and 17<sup>th</sup> years of operations in the working is not in accordance with the provisions of the Income Tax Act. Similar submissions have been made by IWPA also.

### **Commission Ruling**

42. The Commission has now considered the effect of the Income Tax, Minimum Alternate Tax (MAT) and benefits of Income Tax holiday as per provisions under Section 80IA of Income Tax Act for tariff determination purpose and revised the calculations considering other changes as discussed above.
43. Based on the various parameters for tariff determination of wind power plants in Rajasthan as discussed above, the Commission has determined a back loaded tariff corresponding to levelised tariff for 20 years for wind power plants commissioned after 31.3.2007. The levelised tariff for 20 years at 10.6% discount factor are as under :

Particular	Jaisalmer, Jodhpur, Barmer District	Rest of thee Districts
For Wind Power injection on 33kV or 11kV system	Rs. 3.60 per kwh	Rs. 3.78 per kwh
EHV system	Rs. 3.71 per kwh	Rs. 3.89 per kwh

The above tariff are determined based on different CUF and line losses. The tariff schedule is attached at schedule A

The Commission meanwhile also directs in view of the para 56 of the Order dated 29.09.2006 that the process of competitive bidding to purchase RE in particular the wind power be immediately initiated by the distribution licensees for any identified potential area of capacity not less than 50-100 MW as per Gol guidelines with suitable deviations as may be got approved from the Commission so that the competitive tariff as obtained through bidding is adopted by the Commission. The Commission proposes the process of competitive bidding with regard to purchase of RE after the end of the control period ending by March 2009.

**B Biomass based Power Plant**

44. RBPDA, an association of biomass power project developers within Rajasthan and RREC (state nodal agency for Non-Conventional Energy Sources) has sought review on some of the normative parameters including the capital cost of Biomass power project fixed by the Commission in its order and regulations stating that it is low. RREC submitted that regulation 111 (5) specifies that the Commission may effect changes in the parameters and methodology of tariff determination based on guidelines prescribed by Central commission. In this RREC has drawn attention towards the decision of Appellate Tribunal for Electricity (ATE) in the matter of Chattisgarh ERC directing other SERCs to follow the CEA recommendation in respect of Biomass power plant tariff determination. Since Appellate Tribunal is an appealing authority above Central Commission the decision of the ATE is thus falling within the purview of the Commission to review the norms specified in the Regulations for determination of tariff. He further argued that

for such changes in norms for tariff determination no review in the Regulations specified by Commission is necessary. The order of Appellate Tribunal in appeal No. 20/ 2006 at para 12 has held

*“keeping in view the principle that the generation of electricity from renewable sources of energy needs to be promoted, we accept these operational norms as recommended by the CEA’s report as basic norms and the Appropriate Commission to act upon them subject to minor adjustments relating to the local site conditions and further refinement after operational data of 5 years operation of biomass plants in the state aggregating to 100 MW is available. The following normative figures as recommended by CEA be adopted:*

- (a) *Capital cost at the rate of Rs. 4 crore/ MW*
- (b) *O&M expenses including insurance to be 7% of the cost of capital with the annual escalation at the rate of 5%*
- (c) *Auxiliary consumption to be taken as 10%*
- (d) *Normative gross heat rate (kcal/ kwh) – 4500*  
*(SHR to be taken based on actual PG test report of the projects)*
- (e) *PLF of 80% for recovery of full fixed cost*
- (f) *Depreciation @ 7.84% until debt is repaid. Beyond that 20% is to be spread over remaining life of plant.*
- (g) *Specific fuel consumption of 1.36 kg/ kwh with average calorific value of fuel as 3300 kcal/ kg”*

The suggestions of RBDA about analyzing in details of the operational parameters of biomass plants operating on mustard husk in the State does not find favor because the CEA recommendations have been made after collecting data from all such power plants including those of Rajasthan. However these parameters shall be further reviewed for the power plants commissioned after the tariff control period i.e. March, 2009. In view of this such exercise would not only be repetitive but delay the process for the investors in line.

Based on the submissions made by various stake holders, State Government, RREC the corresponding norms specified by the Commission requiring minor adjustments and refinement in terms of the directions of ATE are discussed hereunder:

**Capital cost:**

42. Tariff computation sheet of RBPDA for prescribing the tariff for Biomass power plants, RBPDA has requested to consider the capital cost of a 7.5 MW Biomass power plant at Rs.5.12 Cr/MW for water cooled condenser and Rs. 5.52 Cr/MW for air cooled condenser. RBPDA has submitted that the capital cost for the biomass power project shall be dependent on the several factors such as plant configuration, technology (Boiler type and pressure levels) and would vary depending on capital cost related to fuel handling, storage, crushing equipment, plant and machinery associated with environment management, which in turn would be dependent on type and mix of biomass fuels being considered for plant operations.
  
43. RBPDA and RREC submitted that mustard crop residue is the only sustainable source of biomass in the state of Rajasthan unlike other states where rice husk, ground nut shells, bagasse etc. are available. Due to peculiar characteristic of mustard husk, the technology involved is costlier in comparison to other biomass power project using fuel other than mustard husk. RBPDA and RREC suggested to take Rs. 4.0 Crore per MW at September '06 level and escalation @ 7%, which is current inflation rate may be allowed. RREC further requested to consider reasonable cost for biomass

based power project in Rajasthan with an escalation in cost per annum for the project commissioned after 30.09.2008.

44. DSCL Energy Services has proposed in its presentation the cost of power plant with A grade equipment supply (to sustain 75% PLF over long period) at Rs. 5.12 Cr/MW and with B grade equipment supply at Rs. 4.50 Cr/MW. DSCL Energy Services has further stated that the technology involved in the biomass power project is costlier on account of technical constraints in fuel feeding for low density leafy fuels like straws, stalks, mustard residues etc, high volumetric flow, bridging and choking tendencies, affinity to quickly absorb moisture and agglomerate.
45. Mr. Sanjay Kumar of RBPDA has commented that the capital cost approved by the Commission is not realistic taking into account the rising trend in inflation. He further stated that the cost of boiler has increased by 25% - 30% and requested the Commission to re-look at the capital cost of biomass based power plants.

### **Commission Ruling**

46. The Commission acknowledges the fact that mustard crop residue (Mix of husk and stalk/stem) is a promising fuel with a high calorific value and low ash content. Moreover, power generation from mustard crop residue is based on conventional thermal technology as per Kalpataru Power Transmission Company's presentation for 7.8 MW Biomass Power Project in Rajasthan.
47. The Commission has analyzed the capital cost of biomass power project and looked at the capital costs approved by various State



Electricity Regulatory Commissions of being in the range of Rs.3.50 Cr/MW – Rs. 4.00 Cr/MW for the past commissioned plants. The Commission also observes that the CEA (in November 2005) has recommended capital cost of Rs. 400 lakh/ MW in the past. However, the Commission recognizes the various grievances raised with regard to escalation for the period after November 2005. The CEA's recommendations on capital cost as Rs. 400 lakh per MW is for the plants already commissioned up to 2005-06. Whereas the tariff being determined is for the plant to be commissioned in 2008-09 therefore, the Commission considers the 3 years escalation in the capital cost at the rate of 5.37% p.a. (based on CERC notification dt. 22.11.2006). This works out to Rs. 468 lakh/ MW. This is inclusive of transmission charges of Rs. 12 lakh/ MW. The system connectivity charges of Rs. 2 lakh/ MW payable to RVPN are over and above this cost and accordingly the Commission adopts the capital cost of Rs. 470 lakh per MW for the water-cooled Biomass power plants for the purpose of tariff determination.

**Plant Load Factor:**

48. CEA's recommendation is to consider 80% as PLF whereas the RBPDA has suggested PLF of 60% during stabilisation period & 70% for one year after stabilisation and 75% thereafter. Looking to availability of biomass dependent on vagary of nature more prevalent in the state and the mustard husk causing operational complex problem in its handling system and boiler. The Commission does not consider further refinement or the change in PLF of 60%, 70%, 75% for stabilization period, one year thereafter and for remaining life of the plant respectively.

### **Metering and Line Losses:**

49. RBPDA has suggested to consider metering at ex-generation bus and change the definition of 'interconnection point' or else allow transformation & transmission losses in the tariff. The Commission has already agreed to account for the losses in tariff determination. As the Biomass power plants are injecting power on 33 kV and have metering point at this premises of distribution licensee or STU hence the 1% loss be considered. The Commission has dealt this aspect at para 28 of the order to consider in tariff determination.

### **Plant Life and Depreciation**

50. For the purpose of tariff determination, the Commission considers 20 years life of the Biomass power project as per straight line method, Rate of depreciation of 4.5% excluding the cost of land and its development whereas for transmission system, the CEA's recommendations are for 7.85%. The Commission is of the view that in case of short fall in the amount of depreciation to actual repayment of loan the regulation allows advance against depreciation and therefore higher depreciation is not required to be specified. In view of this no change necessary in this regard.

### **Auxiliary Consumption:**

51. For the purpose of tariff determination for Biomass power projects, the Commission has considered the auxiliary consumption of 10% in case of water cooled condenser and 12% in case of air-cooled condenser. Further, during stabilization period, additional auxiliary power consumption of 0.5% has also been considered. This is in line with the recommendation of CEA hence no change is being made.

### O & M Expenses

52. The recommendations of CEA is to consider O&M expenses as 7% of capital cost whereas the Commission in its draft notification considered the O&M expenses for Biomass power plants as 4% of the capital cost and for transmission system as 3% of the capital cost with an annual escalation of 5% in O&M expenses.
53. RBPDA submits that since the size of biomass power plants is small i.e. 7.5 MW as compared to conventional thermal power plants of 200/250 MW, the expenses on plant managers, shift operators and other establishment/administrative expenses translate into a higher proportion of capital cost in comparison with conventional thermal power plants. RBPDA has submitted the detailed break up of O&M cost for 1<sup>st</sup> year of biomass power plant operation.

S.No.	Particulars for 7.5 MW	Amount in Yr-1 of operations (Rs. Cr)
1	Stores and Consumables Costs	0.73
2	Water Charges	0.24
3	Salaries and Wages	1.41
4	R&M Expenses	0.69
5	Other Manufacturing processes	0.32
6	Administration and General Expenses	0.63
	Total	4.02

54. RBPDA claims that the O&M costs works out to be around 10% of the capital cost and further escalation of 10% p.a. in cases of salaries and wages and 5% p.a. in case of other O&M costs.

### Commission Ruling

55. The Commission analyzed the above submission and considers the O&M expenses as submitted by RBPDA is at higher end vis-à-vis the capital cost and capacity of the project.

56. Taking into consideration the various norms adopted by other State Electricity Regulatory Commissions, the Commission had considered the O&M expenses at 4% of the capital cost and escalation of 5% on O&M expenses per annum for tariff determination of biomass based power project.
57. The Commission has also looked at the Appeal No. 20 of 2006 filed by the various petitioners – Chhattisgarh Biomass Energy Developers Association, KVK Bio Energy Pvt. Ltd, ISA Power (P) Ltd, Sudha Agro Oils and Chemicals Industries, Ecrofen Power and Projects Ltd, before the Appellate Tribunal against the various operational norms adopted in the Tariff Order dated 11.11.2005 passed by the Chhattisgarh State Electricity Regulatory Commission (CSERC). The above mentioned petitioners had appealed that they had accepted the basic operational norms as recommended in CEA's report on "Operational Norms for Biomass based power plants" 2005 and the CSERC to act upon them subject to minor adjustments relating to the local site conditions and further refinement after operational data of 5 years operation of biomass plants in the state aggregating to 100 MW is available. As per the CEA's report, following normative values are finally recommended for existing biomass power plants:

Gross Heat Rate (Kcal/Kwh)	4500
Auxiliary Power Consumption (%)	10%
O&M Expenses (%)	7%
PLF (%)	80%

58. The Commission holds the view that inefficiency should not be allowed to be passed. The O&M expenses of 10% is nowhere acceptable for such power plants even the CEA has observed that 7% is high. As the 7% O&M expenses as recommended by CEA is high and should be reduced hence the Commission considers it appropriate for the time being to consider O&M expenses as 6.5% for power plant which shall be further reviewed after five operational years. The annual escalation in O&M expenses as 5% is in line with the CEA recommendation and hence no change therein is made.

#### **Interest on Debt and Term of Loan**

59. RBPDA has submitted that the average interest rate considered by project cases varies from 11.5% to 13.5%, with majority of the DPRs considering an interest rate of 12.5% p.a. on long term loans for determining cost of generation. As per IREDA norms for biomass power projects, applicable interest rate varies in the range of 11.75% to 12.5%.
60. Mr. Rajeev Swarup from RREC on behalf of the State Government stated that RE sector cannot compete with the conventional sector and as per the Electricity Act 2003, RERC is responsible for promoting the RE sector in the state. Till date, RE sector is risk oriented on account of fuel uncertainty and low returns. He further put forth the various lending norms for different financial institutions in biomass sector. The average rates of interest for debt raising from IREDA, PFC, SBI, IL&FS and ABN AMRO are 10.50%, 11.25%, 12.25% and 13.5% respectively.

61. He further submitted that Chhattisgarh State Regulatory Commission's (CSERC) order dated 11.11.2005 for tariff determination for Biomass power plants was challenged before the Appellate Tribunal for Electricity. The Tribunal in its order dated 29.09.2006 has laid down the norm for interest rate at 11.75%.
62. DSCL Energy Services has proposed the interest rate in the range of 12.5% to 14% for tariff determination and henceforth for the economic viability of Biomass power projects.

### **Commission's Ruling**

63. The Commission acknowledges that the interest rate varies from time to time and may decrease or increase in future. The Commission is of the opinion that 10% interest represents the potential average interest rate for the first control period and therefore, the interest rate at 10% as specified in the order dated 29.9.2006 on long term debt is reasonable for tariff determination process.

### **Working Capital Requirement**

64. RBPDA has submitted that the storage of fuel stock is dependent on various factors like non availability of stock on continuous basis, storage facilities, and the price during season/off season, procurement arrangements etc. RBPDA considers the working capital requirement for fuel ranging from four months to six months.
65. RBPDA has further submitted that the Commission has not considered any receivable as part of working capital requirement and urged to be considered to an extent of 45 days and O&M

- expenses for a period of one month. The interest rates for funding working capital as per RBPDA suggestions should be considered in the range of 13% to 16%.
66. Mr. Rajeev Swarup of RREC on behalf of the State Government has proposed the interest on working capital at the rate of 12.50% on account of the Appellate Tribunal's Order dated 29.09.2006 on CSERC, Chhattisgarh Tariff Order dated 11.11.2005 for Biomass Power Plants.
67. The Commission has already stated earlier that the period of receipt of biomass is 4 months commencing normally from mid February. Thus, stock of biomass for 8 months has to be created. The average stock of biomass will thus be of 4 months. Further, the biomass power plants have been permitted by MNES to generate up to 30% of electricity through conventional fuel to cater to the contingency of short supply of biomass. Besides this, their annual maintenance is to be effected after taking shutdown and for that stock of spares are to be created well in advance.

#### **Commission's Ruling**

68. Keeping in view the above submissions, the Commission considers working capital requirement as 4 months fuel stock, 1 month's O&M and 1 year spare@1% of capital cost as specified in the regulation. No Receivables are considered as the tariff is not subject to prompt payment rebate. Stock of fuel will cause corresponding less stock for biomass and cost differential is considered to be covered in fuel price adjustment. In view of this no change is being made in the tariff calculation on this account. The interest on working capital as

per State Bank of India notification as 12.25% with effect from 20.02.2007 is being considered.

### **Gross Calorific Value of Fuel**

69. The Commission in its draft notification has considered the Gross Calorific Value of biomass as 3400 kcal/kg for the tariff determination process.
  
70. RBPDA submits that mustard residue is the major source of fuel for energy generation from biomass in the state of Rajasthan. However, the availability of crop residues for power generation purposes depends upon several factors such as variation in cropping pattern, change in rainfall in the region, improvements in irrigation technology, consumption/ surplus utilization patterns etc. RBPDA has further stated it necessary to use fossil fuel to a limited extent due to cyclical and seasonal nature of the crop residue. The Commission has stated in its Order that as and when coal is used up to 30% of consumption may be considered by applying fuel cost adjustment with price taken as audited and verified cost of coal and other parameters as defined in the Order.
  
71. RBPDA has further submitted that mustard husk has some peculiar characteristics such as storing of mustard husk causes substantial deterioration in quality affecting its GCV, tendency to absorb moisture on open storage causing more consumption of mustard husk in the boiler to maintain the temperature profile, high water content in the rainy season affecting the thermal efficiency of the boiler. On account of the above, RBPDA further stated that GCV of



the mustard husk get reduced by 12-15% from that in the ideal conditions as the Commission suggested.

72. Based on the above arguments, RBPDA has requested the Commission to consider 100% main biomass fuel having average calorific value of 3100 kcal/kg and use of HSD as secondary fuel for start-up, safe shutdown and flame stabilization process.
73. DSCL Energy Services has commented that on account of biomass properties especially mustard husk like hygroscopic in nature, High alkali content, dust prone, decomposition nature over time and accelerated decomposition when contact with water etc, the net Gross Calorific Value comes down in comparison with the actual GCV.
74. DSCL Energy Services has further put forth a reference study by Dr. P. D. Grover, IIT Delhi in which the average GCV of biomass (mustard husk) in India for a year comes out in the range of 2900-3000 kcal/kg.

#### **Commission's Ruling**

75. The recommendation of CEA is to consider the GCV of biomass at 3300 kcal/ kg. The Commission acknowledges that the mustard husk biomass has difficult storage problem and its spontaneous degradation leads to loss in net heat content. This aspect has already been considered in the order dt. 29.09.2007 after actually considering the local conditions and therefore no review these into called for.

### **Station Heat Rate (SHR)**

76. RBPDA has submitted that Station Heat Rate is one of the key performance parameters for any power plant and is dependent on plant capacity, its design and configuration, type of technology of boiler, plant operation and maintenance practices, quality of fuel and other operational performance over varying load conditions.
77. RBPDA has further submitted that for the purpose of tariff determination of biomass based power plants in the state of Rajasthan, SHR of 4300 kcal/kwh during stabilization period and 4200 kcal/kwh thereafter for water cooled condenser and SHR of 4540 kcal/kwh during stabilization period and 4440 kcal/kwh thereafter for air cooled condenser should be considered.

### **Commission's Ruling**

78. The CEA recommends the SHR of 4500 kcal/ kwh and IREDA is also considering 4200 to 4600 kcal/ kwh for plant size of 6.6 to 20 MW, whereas other states are considering 3700 kcal/ kwh which is quite low. Considering the CEA's recommendations on the basis of study conducted on the actual performing biomass power plants. As no new fact has been brought to the notice of the Commission from the performance guarantee (PG) of the plant manufacturer hence there is no scope to review it further.
79. The Commission further observes that in Order dt. 29.09.2006 at para 103, 240 kcal/kwh extra was allowed for air cooled condenser whereas in the same regulations so published some errors have crept in including the errors in SHR specified. Accordingly, the

regulation 111(3)(ii)(a), (b), (d) and 111 (5) needs be substituted as under:

110(3) (ii) (a) Station Heat Rate (SHR) in kcal/kwh

Sr. No.	Particular	Water-cooled Condenser	Air-cooled Condenser
1	During Stabilization	4300	4540
2	After Stabilization Period	4200	4440

111(3) (b) Gross Calorific Value (GCV) of Biomass (mustard husk)  
3400 kcal/kg

111 (3) (d) Biomass price as Rs. 1050 per MT during financial year 06-07

111(5) The Commission may effect changes in parameters and methodology of tariff determination based on the relevant guidelines prescribed by the Central Commission.

### **Fuel Price and Escalation**

80. RBPDA has proposed the cost of biomass fuel as Rs.1100/Tonne as 'Base' for the first year of operation and HSD price as Rs. 35/L for the tariff determination process.
81. In addition, RBPDA urges the Commission to devise suitable mechanism for monitoring fuel cost and biomass fuel procurement arrangement, as proposed under Clause 4.3.4 of this submission and accordingly determine variable charge compensation for the biomass power projects.

82. DSCL Energy Services submitted that the competitive price of mustard for viability would be in the range of Rs.1850 to Rs.2000 per metric tone. Further, Mustard is competing demand from Brick manufacturers, who are riding on reality boom. Also more and more process industries are shifting to mustard as source of steam in low pressure boilers. A survey showed a chemical plant importing mustard at an average price of Rs. 2800 per MT in Faridabad.
83. DSCL Energy Services has also commented on procurement logistics for biomass as difficult against the simple processes for fossil fuels. The problems concerned with the same are as follows:
1. Collected from fields- entraps sand/mud, which creates problem in combustion.
  2. Bought in carts, trolleys and trucks
  3. Requires 10 times the volume for same amount of fossil fuel
  4. Because of seasonal availability, requires more storage space as compared to fossil fuels
  5. Degrades with the season and has to be preserved by proper dewatering/layout techniques and require more man power.
  6. Handling losses of 4-6% in biomass against 1.5-2% in fossil fuel

### **Commission's Ruling**

84. The price variation formula specified in the regulation was not disputed by any of the stakeholder however the concern is genuine that the relevant price of fuel should be corrected for specified GCV of the biomass i.e. 3400 kcal/ kg. In the PV formula suitable amendment shall be incorporated stating that the  $P_o$  and  $P_n$  shall be defined as the price of biomass containing 3400 kcal/ kg of heat

content. In case the GCV is lower or higher the price of biomass shall be proportionately reduced or enhanced. The Commission in its order dt. 29.9.2006 at para 86 has considered rate of fuel Rs. 1050 per MT for FY 06-07 which has not reflected in the regulation. However for the purpose of working out levelised tariff price escalation on price of fuel @ 5% p.a. has been considered. The total tariff so worked out with the fuel price escalation shall be open for the developer of biomass power plant for acceptance who does not want to get the fuel price adjustment as per the formula specified.

**Income Tax rate, (MAT provisions and Income Tax Holiday)**

85. Sh. Mansukhani of RBPDA endorsed the views of IWPA on applicability of I Tax, MAT and requested the Commission to rectify the error in this regard.

**Commission's Ruling**

86. For the purpose of tariff determination for Biomass power projects, the Commission shall consider necessary change as per the same ruling and the Regulations in line with the provision of the IT Act.

**Return on Equity**

87. RBPDA has submitted in this regard that the biomass power projects need not be treated on par with the conventional power plants. Further, there is a need to provide for incentive over and above normative level of return on equity of 14% to promote investments and capacity addition in this sector.

88. Further, RBPDA submits that biomass based power sector needs encouragement on account of the Commission's responsibility to promote renewable energy, risk and uncertainties oriented, lesser environmental pollution, conserving fossil fuel, significant socio-economic benefits to local populace in terms of employment generation, additional remuneration to farmers, socio infrastructure development etc. Henceforth, RBPDA requests the Commission to consider return on equity of 16%.
89. Mr. Rajeev Swarup of RREC has suggested to follow the Appellate Tribunal's Order dated 29.09.2006 on Chattisgarh ERC's Tariff Order dated 11.11.2005 and requested the Commission to consider the return on equity of 16%.

#### **Commission's Ruling**

90. The Commission has already dealt with this in the earlier Order dated 29.09.2006 at para 80. Therefore no further review is required.

#### **Start-up Power**

91. RBPDA has objected in this regard that the requirement of start-up power and safe shut down/backing down arises not just due to biomass power plant operations, but also on account of many occasions due to interruption in the local grid. RBPDA has further urged the Commission to review the limit of 42 days and put no restriction of number of days for set off of the energy drawl for the start up power and backing down.

**Commission's Ruling**

92. The Commission is of the view that the period of 42 days outage for periodical and post outage is adequate and hence no review on this account is required.
93. Considering the above parameters for biomass based power plants to be commissioned after 30.9.08, the levelised tariff for 20 years at 10.6% discount factor are as under:

Particulars	Tariff
For plants with water cooled condensers	Rs. 4.17 per kwh
For plants with air cooled condensers	Rs. 4.55 per kwh <sup>*</sup>

The year wise tariffs to be paid are annexed at schedule B.

94. Copy of this order be sent to objectors, distribution licensees, CEA & GoR.

[K. L. Vyas]  
Member

\* Corrected vide order dated 14.3.07

**Schedule A: Tariff for wind projects**

Year of operation	Jaisalmer, Barmer, Jodhpur Distts.		Other Distts.	
	Voltage	EHV	33/11 kV	EHV
	Rs./kWh			
1	3.59	3.48	3.67	3.56
2	3.61	3.50	3.71	3.60
3	3.63	3.52	3.75	3.64
4	3.65	3.54	3.79	3.68
5	3.67	3.56	3.83	3.72
6	3.69	3.58	3.87	3.76
7	3.71	3.60	3.91	3.80
8	3.73	3.62	3.95	3.84
9	3.75	3.64	3.99	3.88
10	3.77	3.66	4.03	3.92
11	3.79	3.68	4.04	3.93
12	3.81	3.70	4.05	3.94
13	3.82	3.71	4.06	3.95
14	3.83	3.72	4.07	3.96
15	3.84	3.73	4.08	3.97
16	3.85	3.74	4.09	3.98
17	3.86	3.75	4.10	3.99
18	3.87	3.76	4.11	4.00
19	3.88	3.77	4.12	4.01
20	3.89	3.78	4.13	4.02
<b>Levelised</b>	<b>3.71</b>	<b>3.60</b>	<b>3.89</b>	<b>3.78</b>

**Note:** The tariff under column EHV is for injection of power for up to 50 km line length. If the line length is more than 50 km, additional 2 paise per kWh would be allowed.



**Schedule B: Fixed Charges & Tariff for to be paid for Biomass projects**

Year of operation	Water Cooled			Air Cooled*		
	Fixed Charges (Rs./kWh)	Variable Charges (Rs./kWh)	Total Charges (Rs./kWh)	Fixed Charges (Rs./kWh)	Variable Charges (Rs./kWh)	Total Charges (Rs./kWh)
1	1.97	1.63	3.60	2.20	1.76	3.96
2	1.95	1.69	3.64	2.17	1.82	3.99
3	1.93	1.77	3.70	2.14	1.91	4.05
4	1.91	1.86	3.77	2.11	2.01	4.12
5	1.89	1.95	3.84	2.08	2.11	4.19
6	1.87	2.05	3.92	2.05	2.22	4.27
7	1.85	2.15	4.00	2.02	2.33	4.35
8	1.83	2.26	4.09	1.99	2.44	4.43
9	1.81	2.37	4.18	1.96	2.56	4.52
10	1.79	2.49	4.28	1.93	2.69	4.62
11	1.82	2.62	4.44	1.97	2.83	4.80
12	1.85	2.75	4.60	2.01	2.97	4.98
13	1.88	2.88	4.76	2.05	3.12	5.17
14	1.91	3.03	4.94	2.09	3.27	5.36
15	1.94	3.18	5.12	2.13	3.44	5.57
16	1.97	3.34	5.31	2.17	3.61	5.78
17	2.00	3.50	5.50	2.21	3.79	6.00
18	2.03	3.68	5.71	2.25	3.98	6.23
19	2.06	3.86	5.92	2.29	4.18	6.47
20	2.09	4.06	6.15	2.33	4.39	6.72
Levelised			4.17			4.55

Note:

- (1) First year tariff for 2008-09 is based on biomass fuel price of Rs.1158/MT having GCV of 3400kcal/kg and for subsequent years escalation worked out as per variable cost adjustment formula specified in the Regulations shall be payable.
- (2) The Biomass power plant developer may opt at the time of execution of PPA the variable charges as per this schedule.

\* Corrected vide order dated 14.3.07